CALCULUS.

216. Proposed by PROFESSOR B. F. FINKEL, A. M., 4038 Locust Street, Philadelphia, Pa.

Prove that, if the differential equation $cydx-(y+a+bx)dy-nx(xdy-ydx)=0$, be transformed into an equation between u and x by the substitution $u(y+a+bx+nx^2)=y(c+nx)$, then the variables are separable; and reduce the equation to the form $dv/\phi(v)=dx/\phi(x)$ by the further substitution $v=\alpha u+\beta$, α and β being suitably determined. *Euler.* [Forsyth's *Differential Equations*, p. 48, Ex. 4.]

Solution by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud, England.

The first equation may be written

$$\frac{dy}{dx}=\frac{(c+nx)y}{y+a+bx+nx^2}. \text{ Thus } \frac{dy}{dx}=u,$$

and as $u(y+a+bx+nx^2)=(c+nx)y$, we have by differentiating with respect to x, writing u for $\frac{dy}{dx}$, and $\frac{u(a+bx+nx^2)}{c+nx-u}$ for y, and re-arranging,

$$\frac{du}{[c^2-bc+na+u(b-2c)+u^2]u}=\frac{dx}{(a+bx+nx^2)(c+nx)}.$$

This is of the form $\frac{du}{f(u)}=\frac{dx}{\phi(x)}$.

Let $u=c+nv$, then $du=ndv$, $f(u)=n(a+bv+nv^2)(c+nv)$. Hence,

$$\frac{dv}{(a+bv+nv^2)(c+nv)}=\frac{dx}{(a+bx+nx^2)(c+nx)}$$

which is of the form $\frac{dv}{\phi(v)}=\frac{dx}{\phi(x)}$.

Also solved by W. W. Landis, and G. B. M. Zerr.

DIOPHANTINE ANALYSIS.

132. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Disregarding the order of λ, μ, ν, how many sets of solutions has the congruence $\lambda+\mu+\nu\equiv0$ (mod $p-1$) (p prime)? [A. E. Western.]

*Solution by the PROPOSER.

Let n_i be the number of solutions in which i of the numbers λ, μ, ν are equal. If $p\equiv1$(mod 3) $n_3=3$, the solutions being

*See problems for solution, *Diophantine Analysis*, No. 134.